

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Hiromoto OHNO, et al.

Appln. No.: National Stage of PCT/JP01/06164

Confirmation No.: NOT YET ASSIGNED

Group Art Unit: NOT YET ASSIGNED

Filed: March 18, 2002

Examiner: NOT YET ASSIGNED

For: CLEANING GAS FOR SEMICONDUCTOR PRODUCTION EQUIPMENT

**PRELIMINARY AMENDMENT**

Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

**IN THE SPECIFICATION:**

**Page 1, under "CROSS-REFERENCE TO RELATED APPLICATIONS" delete the first full paragraph and insert the following:**

This application is based on the provisions of 35 U.S.C. Article 111(a) with claiming the benefit of filing dates of U.S. provisional application Serial No. 60/230,811 filed on September 7, 2000 and U.S. provisional application Serial No. 60/261,265 filed on January 16, 2001 under the provisions of 35 U.S.C. 111(b), pursuant to 35 U.S.C. Article 119(e) (1).

**IN THE CLAIMS:**

**Please enter the following amended claims:**

2. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 1, comprising SF<sub>6</sub>, F<sub>2</sub>, and an inert gas.

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3. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 1, comprising SF<sub>6</sub>, NF<sub>3</sub>, and an inert gas.

4. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 1, comprising SF<sub>6</sub>, F<sub>2</sub>, NF<sub>3</sub>, and an inert gas.

5. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 1, wherein the inert gas is at least one selected from the group consisting of He, Ne, Ar, Xe, Kr and N<sub>2</sub>.

6. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 5, wherein the inert gas is at least one selected from the group consisting of He, Ar, and N<sub>2</sub>.

7. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 1, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.01 to 5 and the inert gas is from 0.01 to 500 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

8. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 7, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.1 to 1.5 and the inert gas is from 0.1 to 30 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

9. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 1, which contains at least one gas selected from the group consisting of perfluorocarbon, hydrofluorocarbon, perfluoroether and hydrofluoroether.

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10. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 9, wherein the perfluorocarbon and hydrofluorocarbon each has from 1 to 4 carbon atoms and the perfluoroether and hydrofluoroether each has from 2 to 4 carbon atoms.

12. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 11, comprising an oxygen-containing gas, an inert gas, SF<sub>6</sub>, and F<sub>2</sub>.

13. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 11, comprising an oxygen-containing gas, an inert gas, SF<sub>6</sub>, and NF<sub>3</sub>.

14. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 11, comprising an oxygen-containing gas, an inert gas, SF<sub>6</sub>, F<sub>2</sub> and NF<sub>3</sub>.

15. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 11, wherein the oxygen-containing gas is at least one selected from the group consisting of O<sub>2</sub>, O<sub>3</sub>, N<sub>2</sub>O, NO, NO<sub>2</sub>, CO and CO<sub>2</sub>.

16. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 15, wherein the oxygen-containing gas is O<sub>2</sub> and/or N<sub>2</sub>O.

17. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 11, wherein the inert gas is at least one selected from the group consisting of He, Ne, Ar, Xe, Kr and N<sub>2</sub>.

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18. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 17, wherein the inert gas is at least one selected from the group consisting of He, Ar, and N<sub>2</sub>.

19. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 11, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.01 to 5, the oxygen-containing gas is from 0.01 to 5 and the inert gas is from 0.01 to 500 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

20. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 19, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.1 to 1.5, the oxygen-containing gas is from 0.1 to 1.5 and the inert gas is from 0.1 to 30 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

21. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 11, which contains at least one gas selected from the group consisting of perfluorocarbon, hydrofluorocarbon, perfluoroether and hydrofluoroether.

22. (Amended) The cleaning gas for semiconductor production equipment as claimed in claim 21, wherein the perfluorocarbon and hydrofluorocarbon each has from 1 to 4 carbon atoms and the perfluoroether and hydrofluoroether each has from 2 to 4 carbon atoms.

23. (Amended) A method for cleaning semiconductor production equipment, comprising use of the cleaning gas as claimed in claim 1.

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24. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 23, wherein the cleaning gas as claimed in claim 1 is excited to produce plasma and the deposits in the semiconductor production equipment are removed in the plasma.

25. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 24, wherein the excitation source for the plasma is a microwave.

26. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 23, wherein the cleaning gas as claimed in claim 1 is used at a temperature range of 50 to 500°C.

27. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 23, wherein the cleaning gas as claimed in claim 1 is used at a temperature range of 200 to 500°C in a plasmaless system.

28. (Amended) A method for cleaning semiconductor production equipment, comprising use of the cleaning gas as claimed in claim 11.

29. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 28, wherein the cleaning gas as claimed in claim 11 is excited to produce plasma and the deposits in the semiconductor production equipment are removed in the plasma.

30. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 29, wherein the excitation source for the plasma is a microwave

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31. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 28, wherein the cleaning gas as claimed in claim 11 is used at a temperature range of 50 to 500°C.

32. (Amended) The method for cleaning semiconductor production equipment as claimed in claim 28, wherein the cleaning gas as claimed in claim 11 is used at a temperature range of 200 to 500°C in a plasmaless system.

34. (Amended) The method for producing a semiconductor device as claimed in claim 33, wherein the fluorocompound is at least one compound selected from the group consisting of HF, SiF<sub>4</sub>, SF<sub>6</sub>, SF<sub>4</sub>, SOF<sub>2</sub>, SO<sub>2</sub>F<sub>2</sub>, and WF<sub>6</sub>.

36. (Amended) The method for producing a semiconductor device as claimed in claim 35, wherein the fluorocompound is at least one compound selected from the group consisting of HF, SiF<sub>4</sub>, SF<sub>6</sub>, SF<sub>4</sub>, SOF<sub>2</sub>, SO<sub>2</sub>F<sub>2</sub>, and WF<sub>6</sub>.

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**REMARKS**

The claims have been amended to remove multiple dependency.

Entry and consideration of this Amendment is respectfully requested.

Respectfully submitted,



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**APPENDIX**

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE SPECIFICATION:**

The specification at page 1, first full paragraph “Cross-Reference To Related Applications” has been amended as follows:

This application is based on the provisions of 35 U.S.C. Article 111(a) with claiming the benefit of filing dates of U.S. provisional application Serial No. 60/230,811 filed on September 7, 2000 and U.S. provisional application Serial No. 60/261,265 filed on [December 27, 2000] January 16, 2001 under the provisions of 35 U.S.C. 111(b), pursuant to 35 U.S.C. Article 119(e) (1).

**IN THE CLAIMS:**

The claims are amended as follows:

2. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 1, comprising SF<sub>6</sub>, F<sub>2</sub>, and an inert gas.

3. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 1, comprising SF<sub>6</sub>, NF<sub>3</sub>, and an inert gas.

4. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 1, comprising SF<sub>6</sub>, F<sub>2</sub>, NF<sub>3</sub>, and an inert gas.

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5. (Amended) The cleaning gas for semiconductor production equipment as [described in any one of claims 1 to 4] claimed in claim 1, wherein the inert gas is at least one selected from the group consisting of He, Ne, Ar, Xe, Kr and N<sub>2</sub>.

6. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 5, wherein the inert gas is at least one selected from the group consisting of He, Ar, and N<sub>2</sub>.

7. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 1, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.01 to 5 and the inert gas is from 0.01 to 500 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

8. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 7, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.1 to 1.5 and the inert gas is from 0.1 to 30 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

9. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 1, which contains at least one gas selected from the group consisting of perfluorocarbon, hydrofluorocarbon, perfluoroether and hydrofluoroether.

10. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 9, wherein the perfluorocarbon and hydrofluorocarbon each has from 1 to 4 carbon atoms and the perfluoroether and hydrofluoroether each has from 2 to 4 carbon atoms.

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12. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 11, comprising an oxygen-containing gas, an inert gas, SF<sub>6</sub>, and F<sub>2</sub>.

13. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 11, comprising an oxygen-containing gas, an inert gas, SF<sub>6</sub>, and NF<sub>3</sub>.

14. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 11, comprising an oxygen-containing gas, an inert gas, SF<sub>6</sub>, F<sub>2</sub> and NF<sub>3</sub>.

15. (Amended) The cleaning gas for semiconductor production equipment as [described in any one of claims 11 to 14] claimed in claim 11, wherein the oxygen-containing gas is at least one selected from the group consisting of O<sub>2</sub>, O<sub>3</sub>, N<sub>2</sub>O, NO, NO<sub>2</sub>, CO and CO<sub>2</sub>.

16. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 15, wherein the oxygen-containing gas is O<sub>2</sub> and/or N<sub>2</sub>O.

17. (Amended) The cleaning gas for semiconductor production equipment as [described in any one of claims 11 to 14] claimed in claim 11, wherein the inert gas is at least one selected from the group consisting of He, Ne, Ar, Xe, Kr and N<sub>2</sub>.

18. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 17, wherein the inert gas is at least one selected from the group consisting of He, Ar, and N<sub>2</sub>.

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19. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 11, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.01 to 5, the oxygen-containing gas is from 0.01 to 5 and the inert gas is from 0.01 to 500 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

20. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 19, wherein F<sub>2</sub> and/or NF<sub>3</sub> is from 0.1 to 1.5, the oxygen-containing gas is from 0.1 to 1.5 and the inert gas is from 0.1 to 30 in terms of the volume ratio assuming that SF<sub>6</sub> is 1.

21. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 11, which contains at least one gas selected from the group consisting of perfluorocarbon, hydrofluorocarbon, perfluoroether and hydrofluoroether.

22. (Amended) The cleaning gas for semiconductor production equipment as [described] claimed in claim 21, wherein the perfluorocarbon and hydrofluorocarbon each has from 1 to 4 carbon atoms and the perfluoroether and hydrofluoroether each has from 2 to 4 carbon atoms.

23. (Amended) A method for cleaning semiconductor production equipment, comprising use of the cleaning gas [described in any one of claims 1 to 10] as claimed in claim 1.

24. (Amended) The method for cleaning semiconductor production equipment as [described] claimed in claim 23, wherein the cleaning gas [described in any one of claims 1 to

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10] as claimed in claim 1 is excited to produce plasma and the deposits in the semiconductor production equipment are removed in the plasma.

25. (Amended) The method for cleaning semiconductor production equipment as [described] claimed in claim 24, wherein the excitation source for the plasma is a microwave.

26. (Amended) The method for cleaning semiconductor production equipment as [described in any one of claims 23 to 25] claimed in claim 23, wherein the cleaning gas [described in any one of claims 1 to 10] as claimed in claim 1 is used at a temperature range of 50 to 500°C.

27. (Amended) The method for cleaning semiconductor production equipment as [described] claimed in claim 23, wherein the cleaning gas [described in any one of claims 1 to 10] as claimed in claim 1 is used at a temperature range of 200 to 500°C in a plasmaless system.

28. (Amended) A method for cleaning semiconductor production equipment, comprising use of the cleaning gas [described in any one of claims 11 to 22] as claimed in claim 11.

29. (Amended) The method for cleaning semiconductor production equipment as [described] claimed in claim 28, wherein the cleaning gas [described in any one of claims 11 to 22] as claimed in claim 11 is excited to produce plasma and the deposits in the semiconductor production equipment are removed in the plasma.

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30. (Amended) The method for cleaning semiconductor production equipment as [described] claimed in claim 29, wherein the excitation source for the plasma is a microwave

31. (Amended) The method for cleaning semiconductor production equipment as [described in any one of claims 28 to 30] claimed in claim 28, wherein the cleaning gas [described in any one of claims 11 to 22] as claimed in claim 11 is used at a temperature range of 50 to 500°C.

32. (Amended) The method for cleaning semiconductor production equipment as [described] claimed in claim 28, wherein the cleaning gas [described in any one of claims 11 to 22] as claimed in claim 11 is used at a temperature range of 200 to 500°C in a plasmaless system.

34. (Amended) The method for producing a semiconductor device as [described] claimed in claim 33, wherein the fluorocompound is at least one compound selected from the group consisting of HF, SiF<sub>4</sub>, SF<sub>6</sub>, SF<sub>4</sub>, SOF<sub>2</sub>, SO<sub>2</sub>F<sub>2</sub>, and WF<sub>6</sub>.

36. (Amended) The method for producing a semiconductor device as [described] claimed in claim 35, wherein the fluorocompound is at least one compound selected from the group consisting of HF, SiF<sub>4</sub>, SF<sub>6</sub>, SF<sub>4</sub>, SOF<sub>2</sub>, SO<sub>2</sub>F<sub>2</sub>, and WF<sub>6</sub>.